Exhibit 7

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF ILLINOIS

EASTERN DIVISION

HUNTAIR, INC. Plaintiff, v. CLIMATECRAFT, INC. Defendant.	**Civil Action No. 07 C 6890** **The Honorable David H. Coar** **Magistrate Judge Morton Denlow**

EXPERT REPORT AND DECLARATION OF DR. JAMES RICE SUBMITTED BY CLIMATECRAFT, INC.

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EXHIBIT A – Curriculum Vitae of Dr. James Rice

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I. EXPERIENCE AND QUALIFICATIONS

1. I hold Bachelors, Masters and Ph.D. degrees in Mechanical Engineering. I have worked as a consultant or advisor for over 30 companies including Ford Motor Company, Boeing Aircraft, General Motors, and Siemens. I have authored or co-authored over 30 publications, and numerous consulting reports. I have over 30 years of professional experience in mechanical engineering design and analysis in both academic and industrial environments.

2. A current copy of my curriculum vitae setting forth details of my background and relevant experience is attached as Exhibit A. My curriculum vitae include a listing of cases for which I have served as an expert witness over the last four years and a list of publications I have authored. ClimateCraft has retained me in connection with the above captioned litigation. I am compensated at the rate of $300 per hour. My compensation is not contingent upon the outcome of this litigation.

3. As detailed in my curriculum vitae, I have extensive experience in fluid mechanics in both an academic and industrial environment. This experience includes in particular my participation in the Rotating Machinery and Controls Research Group at the University of Virginia for over five years. My activities in this group were focused on the development of analysis methods for rotating machinery including such applications as the fans in the patents in suit. In addition, during my years with Compuflo, I was involved in the further development and application of fluid mechanics analysis methods in a commercial environment. These methods have been used in a diverse range of applications including fans such as those in the patents in suit. My more recent consulting activities have also included projects in fluid mechanics for a variety of industrial applications.

4. In support of my testimony, I may use various demonstrative exhibits, including but not limited to, fan performance curves and other performance data for ClimateCraft fan arrays. In addition, I may use blow-ups or electronic versions of the figures included in this report as well as animations or other demonstrative evidence.

II. BACKGROUND

5. Huntair, Inc. (hereinafter "Huntair") has accused ClimateCraft, Inc. (hereinafter ClimateCraft") of infringing U.S. Patent No. 7,137,775 ("the '775 patent") and U.S. Patent No. 7,179,046 ("the '046 patent"). The '046 patent claims priority to the '775 patent. The inventor on both of the two patents is Lawrence G. Hopkins and as such I will refer to the two patents collectively as "the Hopkins patents." Although the specification of the two patents is identical, the claims are somewhat different.

III. SCOPE OF TASK

6. It is my understanding that a Markman hearing is scheduled to address claim construction issues in conjunction with the above captioned litigation. The subject matter of the patents in suit is rather complicated technically and as such the claim terms at issue require some background technical information to assist the Court in arriving at a construction. In the following report I have provided the required background technical information. I have also addressed key claim terms at issue in light of this background information.

7. In developing the following report, I have considered the patents in suit, the provisional patent applications and the PCT application that are referred to in the patents in suit as priority documents, the prior art cited, the prosecution history of each patent, and relevant technical literature. A listing of the materials considered is provided in the attached Exhibit B.

8. At all times in this report, I am providing my opinion as to the understanding of one of ordinary skill in the art as of the 2002-2004 time frame.

IV. THE PERSON OF ORDINARY SKILL IN THE ART

9. Based on my more than 30 years of experience in the field of mechanical engineering and experience with numerous different engineering/manufacturing companies, I

believe the person of ordinary skill in the art related to a "Fan Array Fan Section in Air-Handling Systems" as disclosed in the Hopkins patents would have a level of skill that includes a bachelor's degree in Mechanical Engineering with at least two years experience in the field or training as a designer and at least several years of experience in the field.

V. TECHNICAL BACKGROUND

10. The following sections provide a simplified description of the basic operation and design considerations for fans typical of those in the patent in suit.

A. Fan Types

11. In the applications of interest in the patents in suit there are in general two broad types of fans used, i.e., either axial or centrifugal type fans as illustrated below in Figure 1. Although the performance characteristics of these two types of fans will vary somewhat, the following discussion is applicable in general to both types of fans.

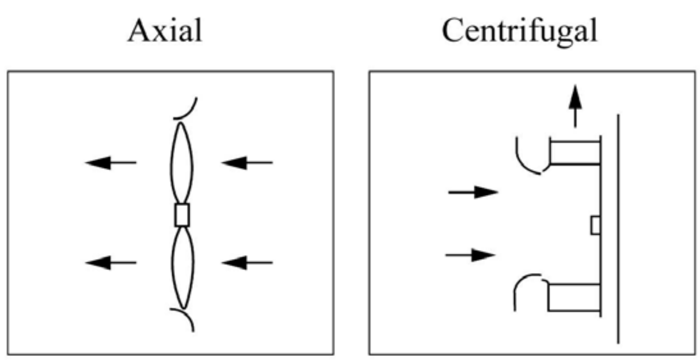

Figure 1. Fan Types[1]

12. The Hopkins patents are directed to an array of fans which includes a plurality of individual fans arranged in matrix configuration. In the following sections, the discussion will focus on individual fan units, but in general the topics discussed may be extended to cover a fan array. Where such an extension is required, the basis of the extension is specifically discussed.

B. Fan Curves

[1] "Fan Performance Characteristics of Centrifugal Fans," Twin City Fan Companies, Ltd., Publication ED-2400.

13. The fan manufacturer will typically provide a "fan curve" or "static pressure curve" which shows the fan performance under a range of operating conditions. These curves show the relationship between the quantity of air a fan will deliver and the static pressure rise generated by the fan at various air quantities. The curves also may also show the required horsepower for a given quantity of flow.

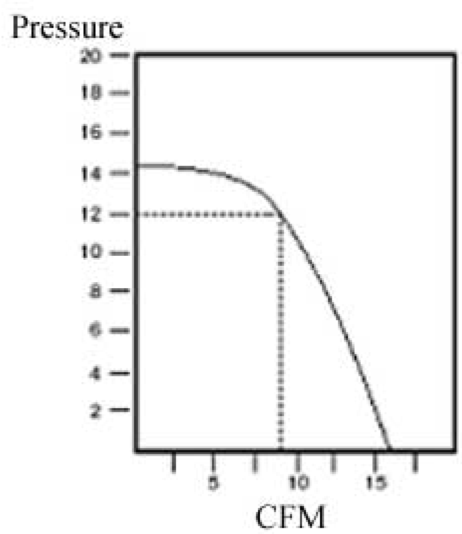

Figure 2. Typical Fan Curve[2]

14. Figure 2 represents the performance for a given fan size, and rotational speed, "RPM." The flow scale, typically in cubic feet per minute ("CFM"), is presented along the x-axis (horizontal). The pressure rise scale, typically expressed in units of inches of water ("inches W.G.") is presented along the y-axis (vertical). For example, 10 inches of water is approximately 0.3 pounds per square inch (psi). The shape of this curve will vary with the design of the fan particularly in the low flow region of the curve. The point where the curve intersects the y-axis, the CFM is zero, is often referred to as the "no flow" point. The point where the curve intersects the horizontal axis, the pressure rise is zero, may be referred to with a number of terms such as "wide open volume," "free delivery," "free air," or "wide open performance" point.

[2] "The Basics of Fan Performance Tables, Fan Curves, System Resistance Curves, and Fan Laws. Greenheck Fan Corp.

15. In the design process, the engineer will typically know the required flow rate and pressure rise for a given application. For a particular fan, he will find the required CFM and move vertically to the static pressure curve, read horizontally to the left to determine the pressure rise provided by the fan at that flow rate.

16. Figure 3 shown below illustrates the effects of speed change, RPM, on the fan performance. According to the fan laws described below, the flow rate, CFM, varies directly with the fan speed, RPM. The result of reducing the speed is a similar curve in a lower position. Similarly, increasing the speed will result in a similar curve at a higher position as illustrated in Figure 3.

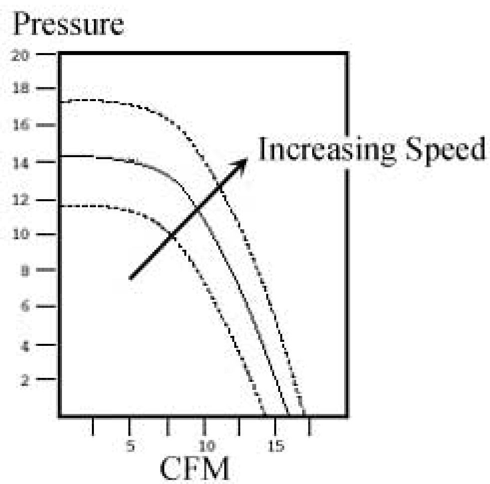

Figure 3. Effect of Fan Speed[3]

17. In addition to the above information shown on the performance graph, the power required to drive the fan at a particular speed may also be shown on the graph as illustrated below in Figure 4. The power required is typically expressed in units of brake horsepower, "BHP." Figure 4 illustrates the addition of the BHP curve. The power scale is presented along the right y-axis. To determine the power, find the flow rate on the CFM axis and move vertically to the BHP curve. At this intersection, move horizontally to the right-hand scale to read the BHP at that flow.

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[3] Ibid.

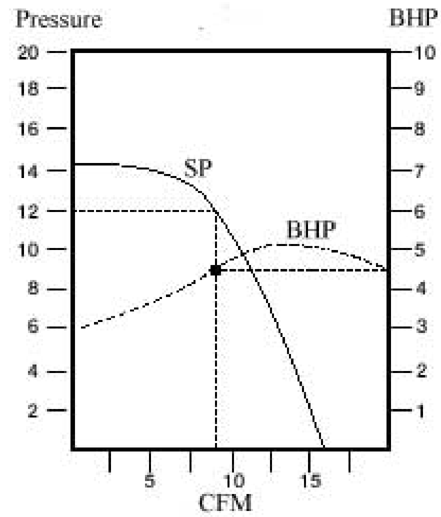

Figure 4. Pressure Rise (SP) and Power Required (BHP)[4]

18. The curve shapes in figures 2-4 are typical of centrifugal fans. Other fan types have both static pressure and power curve shapes that vary somewhat from those shown. However, the principle of reading the curves is the same.

C. Fan Laws

19. The "Fan laws," as listed below, are used to relate to the static pressure rise (SP), flow rate (CFM), and power (BHP) with the speed (RPM).

- CFM varies directly with RPM
- SP varies with the square of RPM
- BHP varies with the cube of the RPM

D. System Resistance

20. In selecting fans, another fundamental aspect is the system resistance. The system includes the overall building duct system and internal components that the fan is providing air flow through. The system resistance curves are a graphical representation of how a system reacts

[4] Ibid.

to a given air flow as illustrated in Figure 5 below. At the operating point, as illustrated in Figure 5, the flow rate and pressure of the fan is in balance with the flow rate and pressure required by the system.

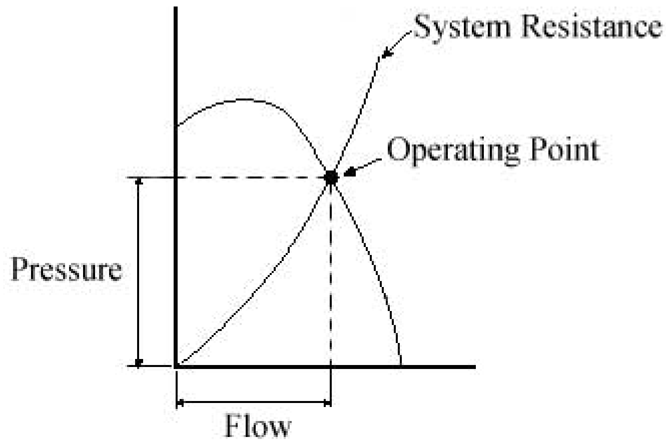

Figure 5. System Resistance[5]

21. The overall system flow resistance is the sum of all the resistances through the duct, all elbows, filters, dampers, coils and any other device that resists flow throughout the system. Figure 5 illustrates that the pressure drop through the system increases approximately as the square of the flow rate.

22. The operating point is the point where the system resistance curve intersects the static pressure curve for the fan. This point is illustrated in Figure 5 above as the "operating point." As introduced above, at this point the system flow and pressure requirements are in balance with the flow and pressure provided by the fan.

E. Fan Efficiency

23. The claims of the Hopkins patents refer to the fan efficiency and in particular operating the fans at "substantially peak efficiency." For this reason, I have presented the

[5] Ibid.

following discussion to explain the term efficiency as one of ordinary skill in the art would have understood. Fundamentally, the efficiency of a fan may be defined in words as the following.

$$Fan\ Efficiency = \eta = \frac{Power\ delivered\ to\ the\ air}{Power\ required\ to\ drive\ the\ fan}$$

24. Because of inherent losses in the process, the power actually delivered to the air will be less than the input power to drive the fan and the efficiency will be less than 1. If we assume the air is incompressible (as explained below), the power delivered to the air is simply the product of the flow rate and the pressure rise across the fan. In consistent units,[6] the fan efficiency it thus given by the following equation.[7]

$$\eta = \frac{Q\Delta P}{H}$$

$$\begin{aligned}&where\\&Q = flow\ rate\\&\Delta P = pressure\ rise\\&H = input\ power\ to\ drive\ the\ fan\end{aligned}$$

25. Consistent units in the standard SI system of units would be Pascal for pressure, cubic meters per second for the flow rate, and watts for the power. Designers in the U.S. typically do not work in terms of consistent units and use more convenient units. As a result, the efficiency equation typically used in practice will include a unit conversion factor as illustrated in the following equation for the fan efficiency (again, if we assume the air is incompressible).[8]

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[6] Consistent units eliminate the need for the inclusion of any unit conversion factors in the basic equations, but the resulting units are quite often unfamiliar and inconvenient. For example, the resulting unit for pressure in the metric system is Pascal which is not commonly used as a unit for pressure.

[7] Laboratory Methods for Testing Fans for Aerodynamic Performance Rating, ANSI/ASHRAE 51-1999, December 2, 1999, p. 16 – 17.

[8] Ibid.

$$\eta = \frac{Q\Delta P}{6362\,H}$$

where

$Q = \text{flow rate in CFM}$

$\Delta P = \text{pressure rise in inches of water}$

$H = \text{input power to drive the fan in horsepower}$

26. Note that the input power to drive the fan, H, may be obtained either by measuring the fan shaft input torque and speed or by using a calibrated motor with a known motor efficiency. In the latter case, the power required to drive the fan may be calculated from the power required to drive the motor using the following equation.

$$H = \eta_M W$$

where

$H = \text{input power to drive the fan}$

$\eta_M = \text{motor efficiency}$

$W = \text{input power to the motor}$

27. The pressure rise across the fan may be expressed in terms of either the static pressure rise or the total pressure rise. The basic efficiency definitions include a "static efficiency" where the efficiency is defined in terms of the static pressure rise and a "total efficiency" where the efficiency is defined in terms of the total pressure rise. The total pressure is simply the sum of the static pressure and the dynamic pressure, which results from the air velocity, as given by the following equation.

$$P_0 = P + \frac{\rho V^2}{2}$$

where

$P_0 = \text{total pressure}$

$P = \text{static pressure}$

$\frac{\rho V^2}{2} = \text{dynamic pressure}$

$\rho = \text{air density}$

$V = \text{air velocity}$

28. In reality, the density of air is a function of pressure and as the pressure increases across the fan the density will increase, i.e., the air is compressed. Typically with fans however, the pressure rise is fairly low and the density change is considered to be insignificant, i.e., the air is considered to be incompressible.

29. The static pressure rise, rather than a total pressure rise, is typically used as the primary performance measure for the subject fans. Total pressure rise is generally used for fans that are connected directly to a duct on the inlet and/or the outlet of the fan. There is usually a difference in the area of the inlet duct to the outlet duct which results in a difference in the dynamic pressure. This difference affects the fan power consumption and must be accounted for in determining the fan performance.

30. In a fan array, the fans are generally connected to a common inlet plenum and a common outlet plenum. These plenums are typically the same size and therefore the air velocity flowing through them is the same at any point of operation. Because there is no change to the velocity from the inlet side of the fan array to the outlet side of the fan array there is no change in the dynamic pressure. Accordingly the total pressure rise and the static pressure rise are the same. As a result, it is common practice for fans of the type currently under consideration to use the static efficiency rather than a total efficiency.

31. An overall performance curve for a typical fan is shown below in Figure 6. Figure 6 includes a number of the parameters discussed thus far: static pressure, total pressure, horsepower, total efficiency, and static efficiency. Figure 6 is for a centrifugal fan with backward inclined blades.

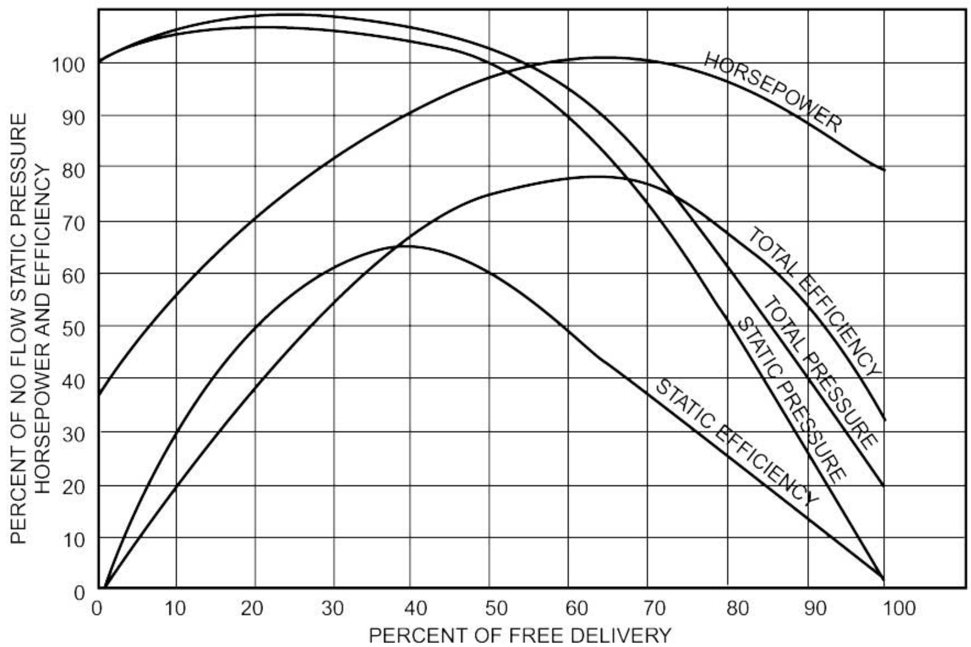

Figure 6. Fan Performance Curves for Backward Inclined Blade[9]

32. As illustrated in Figure 6, there will be a peak static efficiency for the fan somewhere within the overall operating range of the fan. In this case, the static efficiency peaks at approximately 38% of the free delivery flow with a peak value of approximately 65%. It should be noted that there is only a single value of flow and pressure rise at which the efficiency is a peak for a given fan speed (RPM). All of the above curves will shift when the fan speed is changed.

33. For comparison, Figure 7 shown below presents the same set of performance curves for a forward curved fan operating at a single speed.

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[9] "Fan Performance Characteristics of Centrifugal Fans," Twin City Fan Companies, Ltd., Publication ED-2400.

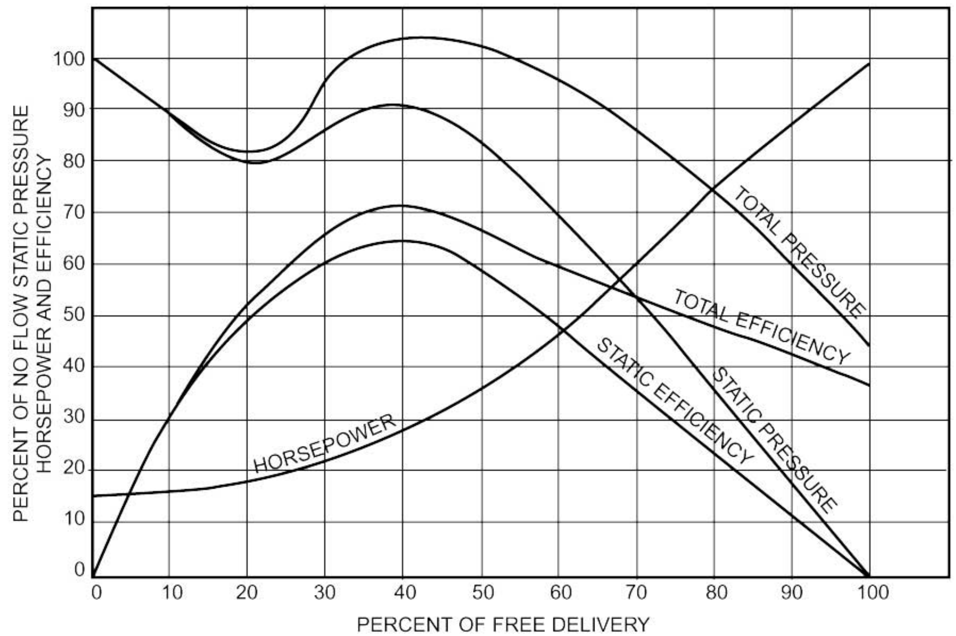

Figure 7. Fan Performance Curves for Forward Inclined Blade[10]

34. As in the backward inclined blade, there is a peak static efficiency for the fan within the overall operating range of the fan. In this case, the static efficiency peaks at approximately 40% of the free delivery flow with a peak value of approximately 65%. Again, it should be noted that there is only a single value of flow and pressure rise at which the efficiency is at the peak for a given fan speed (RPM). Also as noted earlier, all of the above curves will shift when the fan speed is changed.

F. The Surge Line

35. An extremely important consideration in the design, selection, and operation of fans is to avoid "surge." Surge is an instability in the fans that occurs at low levels of flow and high pressure rise where the fan tends to go into stall. It is important to avoid this region of operation for the fan. A "surge line" may be defined on the fan performance curve to delineate the region of operation where surge is likely to occur. A surge line is shown below in Figure 8 on a

[10] Ibid.

typical fan performance plot. Shaded "surge regions" are to the left of the surge line in Figure 8 are areas

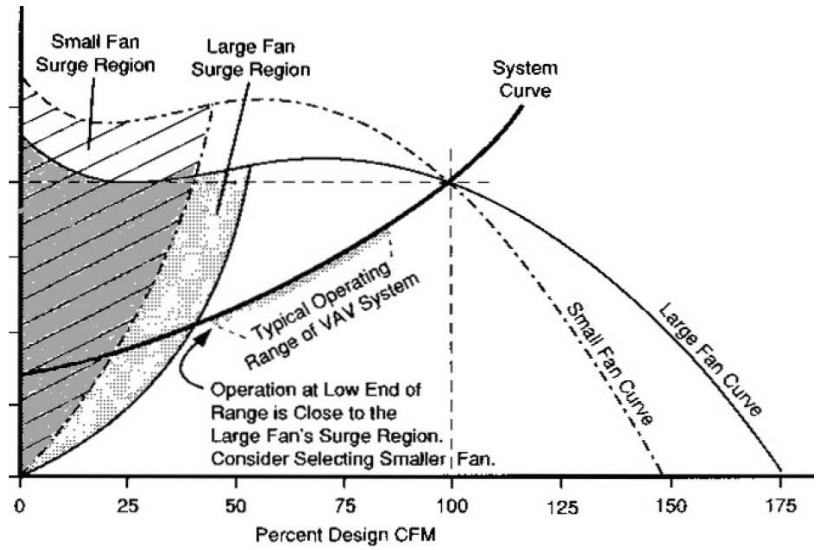

Figure 8. Surge Line[11]

36. In selecting fans, the designer must be careful to avoid a fan which will operate near or to the left of the surge line. Figure 8 shows how a designer might select a smaller fan to avoid operation in the surge area when the flow is controlled by a VFD that can adjust the speed of the fan. The designer generally has a choice of several fan sizes that can meet the flow and pressure requirements of the structure. Each of those fans would result in a different static efficiency and operating speed in order to achieve the desired results. It was well known by one skilled in the art, how to select fans in order to maximize the static efficiency and avoid the surge condition when the system requires lower flow than the design condition.

[11] M. Schaffer, "A Practical Guide to Noise and Vibration Control in HVAC systems, ASHRAE, 1991.

VI. CLAIM CONSTRUCTION ISSUES

37. I understand that before an infringement or invalidity analysis can be completed for a patent claim, the claim must first be construed. I am told that in construing patent claims, the three principle sources of information are the patent's intrinsic evidence: the claims, the specification and the prosecution history. However, extrinsic evidence such as expert testimony, dictionaries, and learned treatises may also be relied upon. However, such evidence is less significant than the intrinsic record in determining the legally operative meaning of claim language.

38. In the following sections, I have identified key claim terms which are used in the Hopkins patents. In particular, I have considered those claim terms which require a considerable amount of technical insight to properly construe. I have attempted to provide the required technical background information in the preceding sections of this report and, in my opinion, have provided an appropriate construction consistent with the technical background.

39. Prior to discussing the specific claim terms, I have presented additional background information of particular relevance to the claim construction in the following two sections. These two sections describe two embodiments of particular significance in the Hopkins patents and information detailed in the prosecution history of the Hopkins patents.

A. Embodiments Disclosed in the Hopkins Patents

40. As introduced earlier, the Hopkins patents are directed to an array of fans for air-handling systems. The Hopkins patents describe a number of embodiments, but these embodiments fall into two principal categories, one directed to controlling the fans to operate at peak efficiency and the other without this control.

41. As described in the specification, each of the fan units in a fan array is controlled by an array controller 300.[12] In one embodiment, called the "peak efficiency embodiment," the array controller 300 can be programmed to turn off certain fan units 200 and run the others at

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[12] '046 patent, Col. 6, lines 20-30.

"peak efficiency." In "an alternative" embodiment, the fan units 200 could all run at the same power level, using a VFD (variable frequency drive).

42. The "peak efficiency embodiment" is again described where "the array controller 300 is able to turn off certain fan units 200 and run the remaining fan units 200 at peak efficiency."[13] This is feature is described a number of times in the specification[14] and illustrated in Figures 13 and 14 of the patents.

43. The other embodiment, calling for a VFD to control the speed of all of the fans in the unit at once,[15] is the only embodiment calling for a VFD. The patent actually teaches that the "on-off" control can also act as a substitute for a VFD: "This ability to turn fans units 200 on and off could effectively eliminate the need for a variable frequency drive."[16] Nowhere in the patent's specifications is the concept of fan speed control combined with control for peak efficiency.

B. Prosecution History of the Hopkins Patent

44. During prosecution of the claims of each patent, Huntair tried to get claims allowed that did not require control for peak efficiency, but was not successful. As a result, all of the claims that issued in the Hopkins patents require some control for peak efficiency.

45. Also during the prosecution of the patents in suit, Huntair made some amendments and arguments to avoid prior art. These arguments are helpful in considering what one of ordinary skill in the art would think the claim terms mean.

46. An argument of particular relevance to claim construction appears at pages 7 and 8 of an amendment dated September 8, 2006.[17] Here, Huntair's patent attorney argued that then-pending Claim 15 was patentable over two references. Huntair's patent attorney argued Claim 15 was patentable U.S. Patent No. 5,701,750 to Ray,[18] saying that "[c]laim 15 has been amended in substantially the same manner as claim 1 except that the control system controls the speed of

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[13] Ibid, Col. 6, lines 64-67.
[14] Ibid, see e.g., Col. 7, lines 4-56, Col. 9, lines 29-39.
[15] Ibid, Col. 6, lines 28-30.
[16] Ibid, Col. 7, lines 15-17.
[17] CL000522-523.
[18] CL000939-952.

individual fans, rather than turning individual fans off, to cause the plurality of fans to run at substantially peak efficiency."[19] Huntair's patent attorney argued Claim 15 was patentable over U.S. Patent No. 4,021,213 to Niedhardt,[20] saying Huntair had carefully reviewed Niedhardt "and can find absolutely no teaching or suggestion of an "array controller being programmed to selectively control the speed of each of said plurality of fan units to run at substantially peak efficiency."[21]

C. Efficiency

47. As discussed in some detail in the preceding sections, one of ordinary skill in the art would have understood the term "efficiency" to mean "the ratio of the power delivered to the air flow to the power required to drive the fan." For a fan array with a common inlet plenum and common outlet plenum, one of ordinary skill in the art would have further understood term to mean a "static efficiency" as opposed to a "total efficiency."

1. Peak efficiency

48. In light of the preceding technical background, one of ordinary skill in the art would have understood the term "peak efficiency" to mean "the maximum efficiency over the range of flow rates from no flow to wide open at a given speed" where the term "efficiency" is defined as above.

2. Substantially peak efficiency

49. One of ordinary skill in the art would have understood the term "substantially peak efficiency" to suggest "an efficiency value close to the peak efficiency," but they would not have understood how close is close enough. There is no commonly understood numerical range of "peak efficiency" one of ordinary skill in the art would have known to be "substantially peak

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19 CL000522.
20 CL000772-777.
21 CL 522.

efficiency." The Hopkins patents provide no guidance whatsoever as to how close the efficiency value should be to the peak efficiency value to constitute "substantially peak efficiency."

D. Control, an Array Controller and Control System

50. The terms "array controller" and "control system" are used in the specification of the Hopkins patents and in claims of the Hopkins patents. To understand the meaning of these terms, one would consider the meaning of "control" to one of ordinary skill in the art. In a most generic sense, one of ordinary skill in the art would have understood "control" to require "receiving input information, determining output information necessary to achieve a desired objective, and producing the required output information to achieve the desired objective." In other words, "control" requires knowing what to look at and what to change to reach a desired result – it is a decision-making process requiring some kind of logic.

51. The term "array controller" is used throughout the specification of the Hopkins patents and in a number of claims of the '046 patent and '775 patents, specifically claims 1 and 16 of the '775 patent. The specification of the Hopkins patents teaches that the "array controller" may be a component of a control system. "A control system (that may include the array controller 300) would be used to take fan units 200 on line (an "ON" fan unit 200) and off line (an "OFF" fan unit 200) individually."22

52. Consistent with the meaning of "control," the specification and with the prosecution history of the patents in suit, one of ordinary skill in the art would have understood the term "array controller" to mean "an automated system to control a fan array which receives input information, determines the output information to achieve a desired objective, and produces the required output information to achieve the desired objective."

53. The term "control system" is used in the specification of the Hopkins patents and in a number of claims of the '046 patent, specifically claims 1, 15, and 19. Consistent with the meaning of "control" and "array controller," the specification and with the prosecution history of the patents in suit, one of ordinary skill in the art would have understood the term "control

[22] '046 patent, Col. 7, lines 12-15.

system" to be "an automated system which receives input information, determines the output information necessary to achieve a desired objective, and produces the required output information to achieve the desired objective."

54. Once these short phrases are understood, one can then look at the longer phrases appearing in the claims of the Hopkins patents that use these phrases.

E. a control system for operating said plurality of fan units at substantially peak efficiency by strategically turning on and off selective ones of said plurality of fan units

55. The term "control system for operating said plurality of fan units at substantially peak efficiency by strategically turning on and off selective ones of said plurality of fan units" is used in limitation (f) of claim 1 of the '046 patent. Claim 1 reads as follows (emphasis added).

> 1. A fan array fan section in an air-handling system comprising:
>
> (a) an air-handling compartment;
> (b) a plurality of fan units;
> (c) said plurality of fan units arranged in a fan array;
> (d) said fan array positioned within said air-handling compartment;
> (e) said air-handling compartment associated with a structure such that said air-handling system conditions the air of said structure; and
> (f) **a control system for operating said plurality of fan units at substantially peak efficiency by strategically turning on and off selective ones of said plurality of fan units.**

56. The required "control system for operating said plurality of fan units at substantially peak efficiency by strategically turning on and off selective ones of said plurality of fan units" would generally be understood to mean something that would (a) receive input information regarding the system air flow requirements, (b) determine the output information necessary, i.e. which fans to turn on and off, and when, to achieve "substantially" peak efficiency of the fan units, and (c) produce that output information (i.e. send a signal to turn individual fans on and off) so that the fan units run at "substantially" peak efficiency.

57. Setting aside the previously mentioned problem regarding "substantially," in my opinion, one of skill in the art would not have understood what specific control system that would do this.

58. This is because designing a control system to maximize the efficiency of fan units by turning selective ones of them on and off is extraordinarily difficult.

59. One of ordinary skill in the art would have known that for any rotational speed the fan array static pressure rise, fan array airflow, and fan array static efficiency are all related to each other by the physical characteristics of the fans selected for the array.

60. One of ordinary skill in the art would not know how to selectively turn fan units on and off to maximize the static efficiency of the fan array. In fact, the fan array is used to provide cooling or heating air to a building structure and the requirements of that structure dictate the airflow and therefore the static pressure requirement to the fan array. One of ordinary skill in the art might conclude that by turning individual fan units on and off to achieve substantially peak efficiency one would have to sacrifice control of the airflow or pressure to achieve such control. This would be counter intuitive to one with ordinary skill in the art since the function of the fan array in the building structure is to provide the proper amount of airflow in order to balance the needs of the structure.

61. The Hopkins patents provide no teaching as to what the algorithm or component is that would operate "said plurality of fan units at substantially peak efficiency by strategically turning on and off selective ones of said plurality of fan units." The only guidance provided by the Hopkins patents is given by the following.[23]

> "The system could turn individual fan units 200 on and off to prevent inefficient use of particular fan units 200. It should be noted that an array controller 300 could be used to control the fan units 200. As set forth above, the array controller 300 turns off certain fan units 200 and runs the remaining fan units 200 at peak efficiency."

[23] '046 patent, Col. 9, lines 33-36.

62. The individual fan units 200 and the array controller 300 referenced in the above quoted section of the specification are shown below in Figure 9 which provides a reproduction of FIG. 13 of the Hopkins patents.

FIG. 13

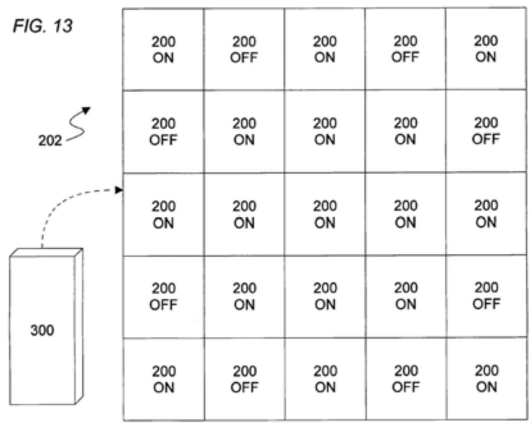

Figure 9. FIG. 13 of the Hopkins Patents

63. Other than the above quoted specification and the above drawing, the Hopkins patents provide no guidance whatsoever as to how both the volume and pressure change requirements of the system can be met by "strategically turning on and off selective ones of said plurality of fan units" and at the same time operate "said plurality of fan units at substantially peak efficiency."

64. As introduced earlier in conjunction with the meaning of the term "control system," there are key components to a control system, i.e., input information, a desired objective, output information, and an algorithm or method to process the information. The heart or "brain" of the control system is the algorithm (the logic). The algorithm is the method by which the input information is used or processed to arrive at the required output information to achieve the desired result. Although the Hopkins patents describe, to a very limited extent, the input information, the output information, and the desired result, there is no teaching whatsoever as to what the algorithm may be.

65. As explained in the preceding technical background sections, the relationships between the volume and pressure rise requirements of the system, the volume and pressure

performance of the fan, and the efficiency of the fan are quite complex and directly dependent upon each other. In addition, one must avoid surge conditions. One of skill in the art would have no idea based on the teaching of the Hopkins patents as to what the structure of such an algorithm might be.

F. a control system for controlling said plurality of fan units, said control system allowing control of the speed of the fan units in said plurality of fan units such that they run at substantially peak efficiency

66. The term "control system for controlling said plurality of fan units, said control system allowing control of the speed of the fan units in said plurality of fan units such that they run at substantially peak efficiency" is used in limitation (f) of claim 15 of the '046 patent. Claim 15 reads as follows (emphasis added).

> 15. A fan array fan section in an air-handling system comprising:
> (a) an air-handling compartment;
> (b) a plurality of fan units;
> (c) said plurality of fan units arranged in a fan array;
> (d) said fan array positioned within said air-handling compartment;
> (e) said air-handling compartment association with a structure such that the said air-handling system conditions the air of said structure; and
> (f) **a control system for controlling said plurality of fan units, said control system allowing control of the speed of the fan units in said plurality of fan units such that they run at substantially peak efficiency**.

67. The required "control system for controlling said plurality of fan units, said control system allowing control of the speed of the fan units in said plurality of fan units such that they run at substantially peak efficiency" would generally be understood to mean something that could (a) receive input information regarding the system air flow requirements, (b) determine the output information necessary, i.e. which fans to speed or slow relative to the others, and when, to achieve "substantially" peak efficiency of the fan units, and (c) produce that output information (i.e. send a signal to speed or slow individual fans) so that the fan units run at "substantially" peak efficiency.

68. Again setting aside the previously mentioned problem regarding "substantially," in my opinion, one of skill in the art would not have understood a specific structure and logic that

could provide a control system that would allow "control of the speed of the fan units in said plurality of fan units such that they run at substantially peak efficiency." As explained in the preceding section, one of skill in the art would have no idea based on the teaching of the Hopkins patents as to what the structure of such an algorithm might be, and would not have understood from the background of the art how to do so.

69. The file history of the '046 patent provides further guidance on the required construction of the term "control system" as used in claim 15. The applicant specifically stated that the control system of claim 15 must provide the capability to control the speed of individual fan units. "Claim 15 has been amended in substantially the same manner as claim 1 except that the control system controls the speed of individual fans, rather than turning individual fans off, to cause the plurality of fans to run at substantially peak efficiency."[24]

70. The above section of the file history clearly indicates that some form of speed control for individual fans is required for claim 15. However, the only mention of such speed control in the specification of the Hopkins patents in the following section of the specification.[25]

> "Another advantage of the present invention is that the array controller 300 (which may be a variable frequency drive (VFD)) used for controlling fan speed and thus flow rate and pressure, could be sized for the actual brake horsepower of the fan array fan section in the air-handling system."

71. The Hopkins patents simply do not teach one of ordinary skill in the art a specific structure and logic would be that would allow "control of the speed of the fan units in said plurality of fan units such that they run at substantially peak efficiency."

72. Moreover, when it comes to controlling an array of fans, whereas turning some on and off to increase overall efficiency is extraordinarily difficult, as I explained above, varying *the speed* of one fan relative to the other to increase efficiency would be extremely troublesome.

[24] File History of the '046 patent, p. CL000522.
[25] '046 patent, Col. 6, lines 30-34.

73. One of ordinary skill in the art would have known that for any rotational speed the fan array static pressure rise, fan array airflow, and fan array static efficiency are all related to each other by the physical characteristics of the fans selected for the array.

74. One of ordinary skill in the art would have known how to control either the static pressure rise of the fan array or the air flow of the fan array by adjusting the speed of all of the fans in unison. This is common practice in the industry when multiple fans are used in parallel. One of ordinary skill in the art would not know how to vary the speed of the individual fan units in order to maximize the static efficiency of the fan array. In fact, the fan array is used to provide cooling or heating air to a building structure and the requirements of that structure dictate the airflow and therefore the static pressure requirement to the fan array

75. One of ordinary skill in the art might conclude that by controlling the speed of the individual fan units to achieve substantially peak efficiency one would have to sacrifice control of the airflow or pressure to achieve such control. This would be counterintuitive to one with ordinary skill in the art since the function of the fan array in the building structure is to provide the proper amount of airflow in order to balance the needs of the structure.

G. a control system for controlling the speed of the fan units in said plurality of fan units such that they run at substantially peak efficiency

76. The term "a control system for controlling the speed of the fan units in said plurality of fan units such that they run at substantially peak efficiency" is used in limitation (f) of claim 19 of the '046 patent. Claim 19 reads as follows (emphasis added).

> 19. A fan array fan section in an air-handling system comprising:
> (a) an air-handling compartment;
> (b) a plurality of independently controllable fan units;
> (c) said plurality of fan units arranged in a fan array;
> (d) said fan array positioned within said air-handling compartment;
> (e) said air-handling compartment associated with a structure such that the said air-handling system conditions the air of said structure; and
> (f) **a control system for controlling the speed of the fan units in said plurality of fan units such that they run at substantially peak efficiency**.

77. The required "control system for controlling the speed of the fan units in said plurality of fan units such that they run at substantially peak efficiency" would generally be understood to mean something that would (a) receive input information regarding the system air flow requirements, (b) determine the output information necessary, i.e. which fans to speed or slow relative to the others, and when, to achieve "substantially" peak efficiency of the fan units, and (c) produce that output information (i.e. send a signal to speed or slow individual fans) so that the fan units run at "substantially" peak efficiency.

78. Again setting aside the previously mentioned problem regarding "substantially," in my opinion, one of skill in the art would not have understood a specific structure and logic that would provide a control system that would provide "controlling the speed of the fan units in said plurality of fan units such that they run at substantially peak efficiency." As explained in the preceding section, one of skill in the art would have no idea based on the teaching of the Hopkins patents as to what the structure of such an algorithm might be, and would not have understood from the background of the art how to do so.

79. The requirement of "independently controllable fan units" and the context of the specification and file history clearly require that some form of speed control for individual fans is required for claim 19. However, the only mention of such speed control in the specification of the Hopkins patents in the following section of the specification.[26]

> "Another advantage of the present invention is that the array controller 300 (which may be a variable frequency drive (VFD)) used for controlling fan speed and thus flow rate and pressure, could be sized for the actual brake horsepower of the fan array fan section in the air-handling system."

80. The Hopkins patents simply do not teach one of ordinary skill in the art a specific structure and logic would be that would allow "control of the speed of the fan units in said plurality of fan units such that they run at substantially peak efficiency."

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[26] '046 patent, Col. 6, lines 30-34.

81. Also, as explained above, when it comes to controlling an array of fans, varying *the speed* of one fan relative to the other to increase efficiency would be extremely troublesome.

82. Therefore, one of ordinary skill in the art would not have known the structure and logic of a specific control system that would operate to control of the speed of the fan units such that they run at substantially peak efficiency.

H. an array controller for controlling said at least six fan units to run at substantially peak efficiency by strategically turning selective ones of said at least six fan units on and off

83. The term "array controller for controlling said at least six [plurality of] fan units to run at substantially peak efficiency by strategically turning selective ones of said at least six [plurality of] fan units on and off" is used in limitation (d) of claim 1 of the '775 patent and, as noted in parentheses, in claim 16 of the '775 patent. Claim 1 reads as follows (emphasis added).

> 1. A fan array fan section in an air-handling system comprising:
> (a) at least six fan units;
> (b) said at least six fan units arranged in a fan array;
> (c) an air-handling compartment within which said fan array of fan units is positioned; and
> (d) **an array controller for controlling said at least six fan units to run at substantially peak efficiency by strategically turning selective ones of said at least six fan units on and off**, wherein each fan unit has a peak efficiency operating range outside of which it operates at a reduced efficiency, and wherein said array controller is programmed to operate said at least six fan units at substantially peak efficiency by strategically turning off at least one fan unit operating at reduced efficiency and running the remaining fan units within said peak efficiency operating range.

84. The required "array controller for controlling said at least six [plurality of] fan units to run at substantially peak efficiency by strategically turning selective ones of said at least six [plurality of] fan units on and off" would generally be understood to mean something that would (a) receive input information regarding the system air flow requirements, (b) determine the output information necessary, i.e. which fans to turn on and off, and when, to achieve "substantially" peak efficiency of the fan units, and (c) produce that output information (i.e. send a signal to turn individual fans on and off) so that the fan units run at "substantially" peak efficiency.

85. Again, setting aside the previously mentioned problem regarding "substantially," in my opinion, one of skill in the art would not have understood what a specific structure and logic would be that would control the fan units to run at substantially peak efficiency by strategically turning selective ones of the fan units on and off. As explained earlier, one of skill in the art would have no idea based on the teaching of the Hopkins patents as to what the structure of such an algorithm might be, and would not have known from the background of the art.

86. The specification of the Hopkins patents teaches that the array controller may be used to respond to variable air volume requirements for example, but fails to teach how to run the remaining fans at "substantially peak efficiency." "In variable air volume systems, which is what most structures have, only the number of fan units 200 required to meet the demand would operate. A control system (that may include the array controller 300) would be used to take fan units 200 on line (an "ON" fan unit 200) and off line (an "OFF" fan unit 200) individually."[27]

87. The Hopkins patents simply do not teach one of ordinary skill in the art a specific structure and logic would be that would allow control of "said at least six fan units to run at substantially peak efficiency by strategically turning selective ones of said at least six fan units on and off."

[27] '046 patent, Col. 7, lines 9-14.

VII. CONCLUSION

88. I reserve the right to supplement, update and/or modify this report or my testimony at trial or otherwise based on information that may later be provided to me, including but not limited to, expert reports provided by Huntair, Inc.

89. I declare under penalty of perjury that the foregoing is true and correct. Executed this 20th day of June, 2008.

By: James Rice

Dr. James Rice

EXHIBIT A – Curriculum Vitae of Dr. James Rice

James G. Rice, Ph.D.
Curriculum Vitae

Contact Information

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Charlottesville, VA 22901

434-326-0148 or 804.687.2465 (mobile)

jrice@mechexpert.com

Professional Summary

Dr. Rice has over 30 years of technical and managerial experience in both industry and academia. His litigation support experience as an expert witness in patent litigation began in 1999. Dr. Rice has a strong technical background in mechanical engineering. Dr. Rice's primary expertise is in computational methods and simulation in mechanical engineering. He has focused in particular on the development and application of computational methods in these areas.

Dr. Rice has also been involved in the development and application of computational methods for a wide range of problems in engineering analysis and design. Dr. Rice was a founder of Compuflo, Inc and an original developer of the FLOTRAN software, which is widely used in industry for myriad fluid mechanics and heat transfer applications. Dr. Rice is the author of over 30 technical publications and has consulted for over 50 companies. Dr. Rice has conducted over 200 seminars and short courses in the US, Europe, and the Orient on fluid mechanics, heat transfer, and computational methods. He has also been an invited speaker at international conferences on computational methods in engineering.

Expertise

- Computational Methods
- Heat Transfer
- Thermodynamics
- Thermal Sciences
- Fluid Dynamics
- Combustion
- Solid Mechanics
- Mechanical Design
- CAE & CAD Software

Education

Year	College or University	Degree
1978	Virginia Polytechnic Institute & State University, Blacksburg, VA	Ph.D.
1973	Virginia Polytechnic Institute & State University, Blacksburg, VA	MSME
1972	Old Dominion University, Norfolk, VA	BSME

Deposition and Trial Testimony for the Last Four Years

Case	Cause No.	Court	Service
Old Reliable Wholesale, Inc. v. Cornell Corp.	5:2006cv02389	U.S. District Court, Northern District of Ohio	Provided Deposition Testimony
Asher et al v. Unarco Material Handling, et al.	6:2006cv00548	U.S. District Court, Eastern District of Kentucky	Provided Deposition Testimony
Medetronic Ave Inc. v. Boston Scientific	2:2006cv00078	U.S. District Court, Eastern District of Texas	Provided Deposition and Trial Testimony
Heraeus Electro-Nite v. Midwest Instrument Co., Inc.	2:2006cv00355	U.S. District Court Eastern District of Pennsylvania (Philadelphia)	Provided Deposition Testimony
Fitness Quest, Inc. v. Jonathan Monti	5:2006cv002691	U.S. District Court, Northern District of Ohio	Provided Deposition Testimony
Lexington Lasercomb et al. v. Unger et al.	9:2006cv80079	U.S. District Court, Southern District of Florida	Provided Deposition Testimony
Lexington Lasercomb et al. v. GMR Products, Inc.	9:2006cv80173	U.S. District Court, Southern District of Florida	Provided Deposition Testimony
Funai Electric Co., Ltd. v. Daewoo Electronics Corp. et al.	3:2004cv01830	U. S. District Court, Northern District of California	Provided Deposition and Trial Testimony
Medetronic Ave Inc. v. Cordis Corp.	2 :2003cv00212	U. S. District Court, Eastern District of Texas	Provided Deposition Testimony

James G. Rice, Ph.D.
Curriculum Vitae

Professional Experience

From: 2001
To: Present
Organization: MechExpert
Title: President
Summary: Consulting and contract engineering activities in the areas of engineering analysis and design, patent litigation, patent development, and software development for both engineering and business applications.

From: 2000
To: 2001
Organization: Synetech Group, Charlottesville, VA
Title: Vice President & Chief Technical Officer
Summary: Information technology company. Developed presidential campaign financial software including web based reporting for the 2000 presidential campaign. The company handled all campaign contributions nation-wide. Extensive database development for both desktop and web based applications.

From: 1998
To: 2000
Organization: Virginia Commonwealth University, Richmond, VA
Title: Adjunct Associate Professor, Department of Mechanical Engineering
Summary: Teaching undergraduate courses in thermodynamics, computational methods, thermal systems design, and computer aided engineering, and computer programming. Instrumental in acquisition of CAE and CAD software for use in the development of the undergraduate program.

From: 1995
To: 1998
Organization: Altair Engineering, Dearborn, MI
Title: Engineering Manager
Summary: Responsible for overall management of engineering service activities involving computational fluid mechanics and heat transfer. Responsibilities included business development as well as the technical management of projects.

From: 1992
To: 1995
Organization: Neural Research, Inc., Charlottesville, VA
Title: President & Founder
Summary: Company was involved in the development and application of neural networks, wavelet based methods, and multi-resolution analysis methods. Applications of these methods were in both engineering and financial analysis.

James G. Rice, Ph.D.
Curriculum Vitae

From: 1987
To: 1992
Organization: Compuflo, Inc., Charlottesville, VA
Title: Co-Founder, Executive Vice President & Chief Technical Officer
Summary: Chief Technical Officer and co-founder of the company as well as developer of the FLOTRAN finite element based computational fluid dynamics analysis software. Primary responsibilities included directing the engineering consulting and service activities, providing technical support to marketing and sales operations, and the overall technical direction for the company.

From: 1981
To: 1987
Organization: University of Virginia, Department of Mechanical and Aerospace Engineering, Charlottesville, VA.
Title: Assistant Professor
Summary: Teaching graduate and undergraduate courses primarily in the areas of heat transfer, fluid mechanics, thermodynamics, and combustion. Also taught courses in computer programming, computational methods, and computer aided engineering. Active participant in the Center for Computer Aided Engineering and taught extensively in the graduate extension program for industry.

From: 1977
To: 1981
Organization: Babcock & Wilcox Company Alliance Research Center, Alliance, Ohio.
Title: Group Supervisor, 1979-1981, Senior Research Engineer, 1977-1979
Summary: Group Supervisor for a software development group. The group developed computational methods for a variety of applications involving computational methods for fluid flow, heat transfer, and combustion in both the fossil and nuclear power industries.

From: 1974
To: 1977
Organization: Virginia Polytechnic Institute & State University
Title: Instructor, Mechanical Engineering Department, Blacksburg, VA
Summary: Primary responsibilities involved teaching undergraduate courses in the thermal sciences; fluid mechanics, heat transfer, and thermodynamics. Also taught the Mechanical Engineering Instrumentation and Measurements Laboratory.

Professional Affiliations, Achievements & Awards

- Member, American Institute of Aeronautics and Astronautics
- Member, American Society of Mechanical Engineers
    - Vice-chairman, Regional Section, 1984-1985
    - Chairman, Regional Section, 1985-1987
- Pi Tau Sigma
- Sigma Xi
- Best Paper: Fifth IEEE Semi-Conductor Thermal and Temperature Measurement Symposium, February 1989

Clientele

- Advanced Micro Devices
- Altair Engineering
- AMP, Inc.
- Babcock & Wilcox Co.
- Black and Decker
- Boeing Vertol
- Brown, Raysman
- CFD Research Corp.
- Cray Research
- Daimler Benz
- Delphi
- U.S. Department of Energy
- Electric Power Research Inst.
- Federal Mogul
- Ford Motor Company
- Fujitsu
- General Motors
- Hyundai Motor Company
- Kaestner & Associates
- Kirkland & Ellis
- Kobe Steel
- Korean Inst. of Science and Tech.
- Macrosonics
- NASA Langley Research Center
- NASA Lewis Research Center
- Nissan
- Pelerin Milnor
- Philips Electronics
- Seagate Storage Technology
- Siemens Automotive
- Sonnenschein Nath and Rosenthal, LLP
- Toyota
- Verizon
- Westinghouse
- Wilkie, Farr, & Gallagher
- Whirlpool/KitchenAid

Publications

1. Lange, Richard J., Rita J. Schnipke, and James G. Rice, “On Thermal Stratification and Migration in Pipe Flow,” ASME Winter Annual Meeting, November 1990.
2. Schnipke, Rita J., James D, Hayword, and James G. Rice, “A Fluid Flow and Heat Transfer Analysis for Evaluating The effectiveness of an IC Package Heat Sink,” Proceedings: Fifth IEEE Semiconductor Thermal and Temperature Measurement Symposium, Vol. 1, No. 1, February 1989
3. Jones, John H., Rita J. Schnipke, and James G. Rice, “FLOW-2D: A Two Dimensional Finite Element Free and Forced Convection PC Computer Code,” ASME Paper No. WA/FE, ASME Winter Annual Meeting, November, 1988.
4. Bulsaro, A. B., M. K. Orazem, and James G. Rice, “The Influence of Axial Diffusion on Convective Heat and Mass Transfer in a Horizontal CVD Reactor,” Journal of Crystal Growth, 1988.
5. Rice, James G., Rita J. Schnipke, D. Kim Cornelius, and Michael D. Normansell, “Navier-Stokes Computation of a Typical High-Lift Airfoil System,” Science and Engineering on Cray Supercomputers, Proceedings of the Fourth International Symposium, Minneapolis, Minnesota, October, 1988.
6. Farnsworth, D. A., and James G. Rice, “Improved Solution Methods for Strongly Coupled Thermal/Hydraulic Analysis,” Nuclear Engineering and Design, Vol. 102, 1987.
7. Schnipke, R. J. and James G. Rice, “Finite Element Analysis of Forced and Natural Convection Heat Transfer,” International Journal for Numerical Methods in Engineering, Vol. 24, p. 117-128 (1987).
8. Rice, James G., and R. J. Schnipke, “An Equal Order Pressure Solution Method that Does Not Exhibit Spurious Pressure Modes,” Computer Methods in Applied Mechanics and Engineering, No. 58 (1986), p. 135.
9. Schnipke, R. J., James G. Rice, and R. D. Flack, “Finite Element Analysis of Viscous Flow in a Vaned Radial Diffuser,” International Journal of Heat and Fluid Flow, 1986
10. Brownell, R. B., R. D. Flack, M. C. Davis, and James G. Rice, “Finite Element Analysis of Viscous Flow in a Vaned Radial Diffuser,” International Journal of Heat and Fluid Flow, 1986.
11. Rosen, M. C., P. E. Allaire, and James G. Rice, “Penalty Function Finite Element Analysis of Steady Incompressible Flow in Rotating Coordinates,” ASME Paper No. 84-GT-36, ASME International Gas Turbine Conference, Belgium, 1984
12. Hassan, Y. A., James G. Rice, and J. H. Kim, “A Stable Three Dimensional Streamline Upwind Scheme,” Proceedings: 12th Southeastern Conference on Theoretical and applied Mechanics, Pine Mountain, Georgia, 1984
13. Hassan, Y. A., James G. Rice, and J. H. Kim, “Three Dimensional Transient and Steady State Calculations for Pressurized Thermal Shock Mixing Experiments,” Multi-Dimensional Fluid Transients, ASME Book No. G00273, 1984.
14. Hassan, Y. A., James G. Rice, and J. H. Kim, “An Improved Multi-Dimensional Finite Difference Scheme for Predicting Horizontal Pipe Flow,” Nuclear Technology, Vol. 65, No. 3 (1984), p. 454
15. Hassan, Y. A., James G. Rice, and J. H. Kim, “Reduction of Numerical Diffusion Errors in Thermal Mixing Problems,” Transactions of the American Nuclear Society, Vol. 45, November 1983.

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16. Hassan, Y. A., James G. Rice, and J. H. Kim, “Cause and Cure of Stability Problems in the Skew Upwind Differencing Scheme,” Transactions of the American Nuclear Society, Vol. 45, November 1983.
17. Hassan, Y. A., James G. Rice, and J. H. Kim, “A New Scheme for Predicting Three Dimensional Temperatures in the Pressurized Thermal Shock Problem,” Transactions of the American Nuclear Society, Vol. 46, June 1984.
18. Schnipke, R. J. and James G. Rice, “Application of a New finite Element Method to Convection Heat Transfer,” Proceedings: Fourth International Conference on Numerical Methods in Thermal Problems, Pineridge Press, 1985
19. Rice, James G. and R. J. Schnipke, “An Efficient Finite Element Method for the Analysis of Viscous Fluid Flow ,” Proceedings: Fourth International Conference on Numerical Methods in Laminar and Turbulent Flows, Pineridge Press, 1985
20. Rice, James G. and R. J. Schnipke, “A Monotone Streamline Upwind Finite Element Method for Convection Dominated Flows,” Computer Methods in Applied Mechanics and Engineering, No. 48 (1985), p. 313.
21. Allaire, P. E., M. C. Rosen, and James G. Rice, “Finite Element Analysis of Viscous Incompressible Flow with a Penalty Function Formulation,” Finite Elements in Analysis and Design, Vol. 1, No. 1 (1985).
22. Schnipke, R. J. and James G. Rice, “Examination of a New Finite Element Method Applied to Convection Heat Transfer,” Finite Elements in Analysis and Design, Vol. 1, No. 3 (1985).
23. Hassan, Y. A., James G. Rice, and J. H. Kim, “Predictions of Horizontal Stratified Pipe Flow,” ASME Paper No. 83-WA/HT-41, ASME Winter Annual Meeting, Boston, MA, 1983.
24. Hassan, Y. A., James G. Rice, and J. H. Kim, “A Stable Mass-Flow Weighted Two Dimensional Skew Upwind Scheme,” Numerical Heat Transfer, Vol. 6, No. 4 (1983), p. 153.
25. Rice, James G., Hassan, Y. A. and J. H. Kim, “Comparison of Measured and Predicted Thermal Mixing Tests Using Improved Finite Difference Techniques,” Nuclear Engineering and Design, Vol.76, No 2, 1983, p. 153.
26. Rice, James G., “Are Our Thermal Science Courses Up to Date,” Proceedings of the 1982 ASEE Conference, Texas A&M University, 1982.
27. Sharma, M. P., James G. Rice, D. K. Cornelius, and D. R. Dougan, “Numerical Computation of Swirling Gas-Particle Flows: Application to Pulverized Coal Classifiers,” Paper No. 80-WA/HT-31, ASME Winter Annual Meeting, July 1980.
28. Overjohn, W. A., S. V. Patankar, and James G. Rice, “THEDA: A Three Dimensional Analysis for Once-through Nuclear Steam Generators,” Chemical Engineering Progress Symposium Series, 19th National Heat Transfer Conference, 1979.
29. Rice, James G., “Experimental and Predicted Performance for the Combustion of a Low Heating Value Gas in a Swirl Burner,” PhD Dissertation, Virginia Polytechnic Institute And State University, Blacksburg, Virginia, September, 1978.
30. Rice, James G., J. R. Grant, and W. C. Thomas, “An Experimental Study of Combustion of a Low Heating Value Gas in a Swirl Burner,” Combustion Institute, Central States Section, NASA Lewis Research Center, Cleveland, Ohio, March, 1977.
31. Rice, James G., “The Modeling of Nitric Oxide Formation in a Swirl Burner with Flue Gas Recirculation,” Masters Thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, September, 1973.

EXHIBIT B – Materials Considered

	Reference	Bates Number
1.	U.S. Patent No. 7,137,775	
2.	U.S. Patent No. 7,179,046	
3.	Prosecution History of U.S. Patent No. 7,137,775	CL 001-371
4.	Prosecution History of U.S. Patent No. 7,179,046	CL 372-692
5.	U.S. Provisional Patent Application Ser. No. 60/456,413, filed Mar. 20, 2003	CL 693-716
6.	U.S. Provisional Patent Application Ser. No. 60/554,702, filed Mar. 20, 2004	CL 717-756
7.	PCT Patent Application Serial Number PCT/US2004/008578, filed Mar. 19, 2004	
8.	U.S. Patent No. 4,241,871	CL 0795-0805
9.	U.S. Patent No. 4,426,960	CL 0806-0812
10.	Osborne, W.C. and Turner, C.G., co-editors, "Woods Practical Guide to Fan Engineering," 1964, cover pages and pp. 121, 137-138, 146-148, 208, and 218	CL 0319-0328.
11.	Wilcke, William F. and Morey, R. Vance, "Selecting Fans, Determining Airflow for Crop Drying, Cooling, Storage," 1998, 8 pages, Regents of the University of Minnesota	CL 0329-0336
12.	AAON worksheet and drawing regarding Borders East Towers job for customer Borders Group, dated Feb. 26, 2001 and Feb. 6, 2001 (2 pages)	CL 0295-0296
13.	AAON order form, estimating worksheet, and facsimile transmission regarding The Commons job, dated Sep. 15, 1998, Sep. 30, 1998 and Jun. 30, 1998 (3 pages)	CL 0297-0299
14.	AAON wiring diagram assignment and verification regarding Farm Show Arena job, Apr. 1, 2002 (1 page)	CL 0300.
15.	AAON worksheet and drawing regarding Harrison Hills job, both dated Feb. 26, 2002 (2 pages)	CL 0301-0302.
16.	AAON RL Feature Master Number sheet, dated Oct. 17, 2001 (1 page)	CL 0303.
17.	U.S. Patent No. 3,332,621	CL 0761-0766.
18.	U.S. Patent No. 3,898,019	CL 0767-0771.
19.	U.S. Patent No. 4,158,527	CL 0785-0794.
20.	U.S. Patent No. 5,269,660	CL 0872-0881.
21.	U.S. Patent No. 5,572,403	CL 0903-0911)
22.	U.S. Patent No. 5,793,610	CL 0977-0986.
23.	U.S. Patent No. 6,031,717	CL 0987-0998.
24.	U.S. Patent No. 6,072,397	CL 0999-1009.
25.	U.S. Patent No. 6,463,891	CL 1122-1137.
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27.	Mammoth Selection Guide for Custom Penthouse (200-410 Tons Cooling-only VAV configurations, 1992 (14 pages.	CL 0304-0317.
28.	U.S. Patent No. 4,494,006	CL 0813-0818.
29.	U.S. Patent No. 4,651,922	CL 0819-0827.

30.	U.S. Patent No. 4,800,653	CL 0835-0848.
31.	U.S. Patent No. 5,546,272	CL 0891-0902.
32.	U.S. Patent No. 5,632,677	CL 0912-0920.
33.	U.S. Patent No. 5,664,995	CL 0921-0938.
34.	U.S. Patent No. 5,701,750	CL 0939-0952.
35.	U.S. Patent No. 5,745,041	CL 0960-0966.
36.	U.S. Patent No. 5,787,971	CL 0967-0976.
37.	U.S. Patent No. 6,257,832	CL 1020-1028.
38.	U.S. Patent No. 6,386,826	CL 1029-1042.
39.	EP 0205979	CL 0953-0959.
40.	U.S. Patent No. 3,156,233	CL 0757-0760.
41.	U.S. Patent No. 5,370,576	CL 0882-0890.
42.	U.S. Patent No. 5,788,568	CL 9582-9594.
43.	U.S. Patent No. 6,791,836	CL 9595-9606.
44.	AAON, RL Series Rooftop Conditioners, Sep. 2001	CL 0662.
45.	Jim Parro (Marketing Manager for AAON) New Promotional Literature The RL Series	CL 0338.
46.	AAON, RL Series 45 to 230 tons Packaged Rooftop Conditioners & Air Handlers	CL 0596-0660.
47.	AAON, Invoice No. 265184, Feb. 28, 2002	CL 0339.
48.	AAON, Order Form and Associated Documents, Nov. 14, 2001	CL 0340-0347.
49.	U.S. Patent No. 4,021,213	CL 0772-0777.
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